U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: SPECIFICATION FOR AIRPORT AND HELIPORT BEACONS

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Initiated by: AAS-200

AC No: 150/5345-12C
Change:

1. PURPOSE. This advisory circular (AC) contains equipment specifications for light beacons which are used to locate and identify civil airports, seaplane bases, and heliports.

2. CANCELLATION. Advisory Circular 150/5345-12B, Specification for L-801 Beacons, dated September 8, 1977, is cancelled.

3. PRINCIPAL CHANGES. In addition to minor changes in the text, the AC has been revised to:

a. Include a beacon for use where greater conspicuity is needed due to a high level of ambient lighting.

b. Include an identification beacon for use in distinguishing one airport from another.

4. METRIC UNITS. To promote an orderly transition to metric units, the specification includes both English and metric units. The metric conversions may not be exact equivalents, and until there is an official changeover to the metric system, the English dimensions will govern.

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SPECIFICATION FOR AIRPORT AND HELIPORT BEACONS

1. SCOPE AND CLASSIFICATION.

1.1 Scope. This specification covers the requirements for civil airports, seaplane bases, and heliport light beacons.

1.2 Classification.

1.2.1 Types.

L-801A	Medium intensity airport beacon
L-801H	Medium intensity heliport beacon
L-801S	Medium intensity seaplane base beacon
L-802A	High intensity airport beacon
L-802H	High intensity heliport beacon
L-802S	High intensity seaplane base beacon
L-803A	Airport identification beacon
L-803S	Seaplane base identification beacon

1.2.2 Classes.

Class 1	For operation down to -30° C
Class 2	For operation down to -55° C

1.2.3 Options.

Automatic Lampchanger
Lamp Monitor

2. APPLICABLE DOCUMENTS.

2.1 General. The following documents, of the issue in effect on the date of application for qualification, form a part of this specification, and are applicable to the extent specified herein.

2.2 Federal Aviation Administration (FAA) Advisory Circular.

AC 150/5345-1 Approved Airport Lighting Equipment

2.3 FAA Standard.

FAA-STD-020 Transient Protection, Grounding, Bonding and Shielding Requirements for Equipment

2.4 Federal Standard.

Standard 595 Colors

2.5 Federal Specifications.

QQ-P-416	Plating, Cadmium (Electrodeposited)
TT-E-489	Enamel, Alkyd, Gloss

2.6 Military Standards.

MIL-STD-462	Electromagnetic Test Methods
MIL-STD-810	Environmental Test Methods

2.7 Military Specifications.

MIL-C-7989	Covers, Light-Transmitting, for Aeronautical Lights, General Requirements for
MIL-C-25050	Color, Aeronautical Lights and Lighting Equipment, General Requirements for

2.8 Society of Automotive Engineers (SAE) Standard.

SAE J576	Plastic Materials for Use in Optical Parts Such as Lenses and Reflectors of Motor Vehicle Lighting Devices

2.9 Illuminating Engineering Society (IES) Publication. Guide for Calculating the Effective Intensity of Flashing Signal Lights (as contained in the publication Illuminating Engineering for November 1964, Volume LIX, page 474, published by the Illuminating Engineering Society).

LM-35	IES Approved Method for Photometric Testing of Floodlights Using Incandescent Filament or Discharge Lamps

2.10 American Society of Testing and Materials (ASTM) Standard.

B-633	Electrodeposited Coatings of Zinc on Iron and Steel, Specification for

(Copies of FAA advisory circulars may be obtained from the Department of Transportation, Publications Section, M-442.32, Washington, D.C. 20590, or from any Government Printing Office bookstore listed in AC 00-2.)

(Copies of FAA specifications may be obtained from the Federal Aviation Administration, Program Engineering and Maintenance Service, Washington, D.C. 20591.)

(Copies of military documents may be obtained from the Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120, ATTN: Code CDS.)

(Copies of Federal specifications and standards may be obtained from the General Services Administration offices in Atlanta, Georgia; Boston, Massachusetts; Chicago, Illinois; Denver, Colorado; Fort Worth, Texas; Houston, Texas; Kansas City, Missouri; Los Angeles, California; New York, New York; Philadelphia, pennsylvania; San Francisco, California; Seattle, Washington; and Washington, D.C.)

(SAE standards may be obtained from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.)

(IES documents may be obtained from the Illuminating Engineering Society, 345 East 47th Street, New York, New York 10017.)

(ASTM standards may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

3. REQUIREMENTS.

3.1 General. This specification covers the requirements for light beacons intended for use in locating and identifying lighted civil airports, seaplane bases, and heliports.

3.2 Environmental Requirements. The light beacons shall be designed to operate under the following environmental conditions:

a. Temperature. Any ambient temperature from -30° C to +55° without auxiliary heater(s) for Class 1, and -55° C to +55° C for Class 2.

b. Wind. Wind velocities to 100 miles per hour (161 kilometers per hour).

c. Rain and Hail. Exposure to rain and hail.

d. Ice. If so provided, the exposed rotating mechanism shall start and rotate at the appropriate speed with a one-half inch (12.7 mm) coating of clear ice within 30 seconds.

3.3 Photometric Requirements. The beacons shall appear to an observer, at any point throughout 360 degrees in azimuth, as a light source emitting flashes of white and/or colored light at the specified rate, colors, and intensitities.

3.3.1 Flash Rate. The frequency of total flashes shall be as follows:

L-801A L-801S L-802A L-802S	24 to 30 flashes per minute (fpm)
L-801H L-802H	30 to 45 fpm
L-803A L-803S	6 to 8 words* per minute

* A word is defined as the three- or four-character (alphameric) airport identifier, expressed in International Morse Code.

3.3.2 Flash Duration. The effective duration of individual flashes shall be as follows:

All L-801 and L-802	75 to 300 milliseconds (ms)
All L-803, dot only *	150 to 200 ms

* All signals shall meet the timing relationships of International Morse Code.

The above requirements may be met in capacitor-discharge beacons by a series of rapid successive flashes which appear to be one uninterrupted flash to a viewer.

3.3.3 Signal Format. The beacons shall provide the following colored signal:

L-801A & L-802A	Alternate white and green
L-801S & L-802S	Alternate white and yellow
L-801H & L-802H	Alternate white, green, and yellow
L-803A	Green
L-803S	Yellow

3.3.4 Light Intensity. The light intensity shall be as follows, with the beacon operating at rated voltage:

Beacon	Elevation Angle, in degrees	Minimum Effective Intensity of Flash, in candelas	
L-801A &	1 to 2	25,000	(Note 2)
L-801S	2 to 8	50,000	"
(see Note 1)	8 to 10	25,000	"
L-801H	1 to 2	12,500	"
(see Note 1)	2 to 8	25,000	"
	8 to 10	12,500	"
L-802A &	1 to 2	37,500	"
L-802S	2 to 8	75,000	"
(see Note 1)	8 to 10	37,500	"
L-802H	1 to 2	18,750	"
(see Note 1)	2 to 8	37,500	"
	8 to 10	18,750	"
L-803A	0 to 45	2,000	(Note 3)
L-803S	0 to 45	2,000	"

NOTES:

1. The light beam center is to be set at 5 degrees above the horizontal for these parameters.

2. The intensities are expressed in white light.

3. The intensities expressed are in colored light.

The effective intensity of the colored lights shall not be less than the values specified for white light multiplied by the following factors: yellow - 0.40, and green - 0.15.

3.4 Design Requirements.

3.4.1 General. The beacons may be designed as a rotating type using steady-burning lamps, or as a nonrotating type using omnidirectional flashing lamps. The total input power, size, and weight of the beacon shall be held to the minimum necessary to meet the specification requirement.

3.4.2 Input Voltage. The beacons shall be designed to operate from a standard voltage ± 10 percent, below 600 volts, 60 Hertz, alternating current.

3.4.3 Lamps. The beacon shall use lamps with a minimum rated life of at least 2,000 hours at rated voltage.

3.4.4 Light Transmitting Materials. When used, glass for the light cover, lenses, and color screen(s) shall meet the requirements of MIL-C-7989, Class B. Plastic used for these elements shall meet the requirements of MIL-C-7989, Class D and SAE J576, except as follows: (a) "vehicle" and "motor vehicle" is to be read as "beacon," and (b) "SAE J576" is to be read "MIL-C-25050, Type I."

3.4.5 Motor. Motors used on rotating-type beacons shall have adequate capacity to start and operate the beacon under the specified environmental conditions. Universal-type motors are not acceptable. The motor and turntable drive shall not cause vibration of lamp filaments (if used).

3.4.6 Vertical Adjustment. The light beam center of all beacons except L-803 shall be field-adjustable using common hand tools through vertical angles of 2 to 10 degrees above the horizontal. A scale marked in one-inch degree increments shall be provided to indicate the vertical setting.

3.4.7 Interlock Switches. Interlock switches shall be incorporated into capacitor-discharge beacons so that, upon opening the access door or cover, the incoming power is disconnected and capacitors are discharged to a maximum of 50 volts within 30 seconds.

3.4.8 Mounting. The beacon shall be designed for mounting on a flat, horizontal surface, and shall be provided with easily accessible leveling points to facilitate leveling during installation and maintenance.

3.4.9 Transient Suppression. Transient suppression shall be provided as per FAA-STD-020, section 3, for all solid-state designs. In addition, transients caused by lighting, induction, static, switching, electromagnetic interference, etc., shall be suppressed. The transient suppression devices shall be capable of withstanding a 10 x 20 microsecond current surge of 15,000 amperes with the subsequent power-follow current and a voltage surge of 10 kV/microsecond minimum.

3.4.10 Electronic Interference. The beacon shall not generate any interference to electronic communication and/or navigation equipment normally used on an airport.

3.4.11 Corrosion Protection. All ferrous surfaces shall be protected from corrosion. Exterior surfaces are to be protected by paint; it shall be with a body coat and two finish coats of alkyd baking enamel in accordance with Federal Specification TT-E-489, Class B. The color shall be either international orange, color number 12197, or aviation yellow, color number 13538, in accordance with Federal Standard No. 595. The final painted surfaces shall be free of blotches, scratches, and runs. If corrosion resistance is provided for interior surfaces by galvanizing, it shall be in accordance with ASTM B-633, SC 4; if by cadmium plating, it shall be Class I, Type II, of Federal Specification QQ-P-416.

3.4.12 Parts Rating. All parts shall be of adequate rating for the application and shall not be operated in excess of the parts manufacturer's recommended ratings during operation of the beacon throughout the specified environmental range (paragraph 3.2). Components shall be derated by the interior temperature rise above the maximum outside ambient temperature at an altitude of 2,000 m (6,000 feet) Mean Sea Level.

3.4.13 Nameplate. Permanent nameplate(s), with the following minimum information, shall be attached to the light beacon:

Light Beacon
Identification: FAA L- _____
Voltage _____ Wattage _____
Manufacturer's Part No. _____
Manufacturer's Name or Trademark _____

3.5 Options. The following options are not required for qualification. If any are provided, they must be qualified to paragraph 4 of this specification.

3.5.1 Automatic Lampchanger. The lampchanger shall automatically bring auxiliary lamp(s) into operation in the correct focal position when the service lamp(s) fail.

3.5.2 Lamp Monitor. A circuit shall be provided to permit connection to an indicator lamp and/or buzzer at a remote point to indicate failure of the service lamp(s).

3.6 Instruction Book. An instruction booklet shall be provided with each beacon and shall contain the following information as a minimum:

a. Information as to safety requirements while maintaining the equipment.

b. Description of circuit operation.

c. Circuit schematics and wiring diagrams.

d. Photographs or mechanical drawings of each component of equipment showing all component parts.

e. Complete parts list with each circuit component keyed to the designation assigned on schematics or wiring diagrams. Complete information, including the original manufacturer's part number, shall be given for each part to permit ordering for replacement purposes.

f. Recommended preventative maintenance.

g. Troubleshooting information.

h. Physical characteristics (weight, height, mounting dimensions).

i. Installation instructions.

j. Operating instructions.

4. QUALIFICATION REQUIREMENTS.

4.1 Qualification Request. Procedures for obtaining qualification approval are contained in the current edition of AC 150/5345-1, Approved Airport Lighting Equipment.

4.2 Qualification Tests. Each type, class, and option of light beacon to be approved shall be tested.

4.2.1 Visual Examination. All beacons shall be visually inspected for quality of workmanship, fabrication, finish, and adequacy for the intended purpose.

4.2.2 High Temperature Test. The beacon shall be placed in a test chamber at ambient temperature, then connected and operated to determine that no malfunction or damage was caused by faulty installation or handling. The temperature of the test chamber shall then be raised to 55° C, with the beacon inoperative, and maintained for a period of 12 hours. The beacon shall then be operated and left operating in the test chamber at a temperature of 55° C for a period of 36 hours. Optional equipment shall be demonstrated to operate at the end of the 36 hours. Failure of the equipment to operate properly, or deterioration of any component is cause for denial of approval.

4.2.3 Low Temperature Test. The beacon shall be placed in a test chamber at ambient temperature, then connected and operated to determine that no malfunction or damage was caused by faulty installation or handling. The temperature of the test chamber shall then be lowered to -30° C for Class 1, or -55° C for Class 2, with the beacon inoperative, and maintained for a period of 12 hours. The beacon shall then be operated and left operating in the test chamber at the same temperature for a period of 1 hour. Optional equipment shall be demonstrated at the end of this hour. Failure of the equipment to rotate within 30 seconds (if of a rotating design) or to flash within 30 seconds (if of omnidirectional design), failure of the lamp(s) to operate properly, or deterioration of any component is cause for denial of approval.

4.2.4 Rain Test. The rain test shall be in accordance with Method 506, Procedure I, of MIL-STD-810. The equipment shall be operated during the test, and failure to operate properly or evidence of water accumulation within the equipment is cause for denial of approval.

4.2.5 Photometric Tests. Tests shall be conducted to prove conformance with all photometric requirements. Effective intensity shall be calculated as specified in Illuminating Engineering, Volume LIX, November 1964, Guide for Calculating Effective Intensity of Flashing Signal Lights.

4.2.5.1 Procedures. Before testing, photometric equipment shall be calibrated in accordance with paragraph 6 of IES publication LM-35. The photometric axes are established in relation to a properly installed (and aimed, if applicable) fixture; the horizontal axis passes through the center of the beacon, and the vertical axis runs through the center of the beacon and is perpendicular to the ground plane. Lamps shall be seasoned in accordance with paragraph 2.2 of LM-35. The beacon being tested shall be operated until it reaches a stable operating condition before conducting the test. Tests will be run with a minimum of five randomly-selected production-run lamps.

4.2.5.2 Beam-Type Beacons. For beacons with a horizontal beam width greater than 10 degrees but less than 180 degrees, at least one horizontal "cut" shall be taken to measure the light intensity at each one degree interval throughout the required vertical beam spread. At least ten readings shall be taken at each horizontal "cut." All five lamps shall be measured with a minimum of one "cut" through the beam center.

4.2.5.3 Omnidirectional Beacons. For beacons with a horizontal beam width greater than 180 degrees, the vertical beam spread shall be measured at least every 30 degrees of the horizontal beam width. These vertical readings shall range over the required angles of elevation specified in paragraph 3.3.4, with a minimum of ten measurements made per vertical reading.

4.2.5.4 Chromaticity. Each beacon shall be tested with each type of filter, lamp, and optical system to be used in the fixture to ensure that it meets the intensity and chromaticity requirements. Alternatively, chromaticity and transmissivity for color filters may be measured, while at the operating temperature of the beacon, and used to calculate color photometric output from measurements taken in white light.

4.2.5.5 Test Report. The test report shall be presented in accordance with paragraph 8.2 of LM-35, except that "floodlight" shall be read as beacon, and "NEMA" as FAA.

4.2.6 Humidity Test. The test shall be in accordance with Method 507, Procedure I, of MIL-STD-810, except that the maximum temperature shall be 55°C, and a total of three complete cycles (72 hours) shall be required.

4.2.7 Wind Test. The wind test may be made in a wind tunnel, or by applying a simulated wind load at 90° to the vertical axis of the beacon. The beacon shall not suffer distortion or other damage that will impair normal operation. The load shall be held for 20 minutes.

4.2.8 Ice Test. The ice test shall be conducted by actually building up a one-half inch (12.7 mm) coating of clear, smooth ice on the beacon while inoperative in a cold chamber maintained at -30° C for Class 1, or -55° C for Class 2. The temperature shall be maintained for no less than 4 hours after the required ice load has been built up, and then normal power shall be applied to the beacon. The beacon shall operate normally after applying the power; the beacon must rotate if so designed, within 30 seconds. This test may be combined with the low temperature test.

4.2.9 Transient Suppression Test. The input power lines of all solid-state designs shall be tested in accordance with method CS06 of MIL-STD-462, including Notices 1, 2, and 3, both series and shunt methods, to demonstrate that the transient suppression meets the requirements of this specification. On completion of the transient suppression test, the beacon and any optional equipment shall continue to operate normally.